## Welcome to Boot Camp!

## Ice breaker instructions:

- You all have a name tag on your back with the name of a celebrity.
- Ask each other yes or no questions to help you guess whose name is on your back
- When you've guessed it, move the name tag to your front

- **Workshop 1:** The Culture of Research Environments
- **Workshop 2:** Asking Scientific Questions
- **Workshop 3:** Communicating Science
  - Keeping a Lab Notebook
  - Giving Group Meeting
  - Reading a Scientific Paper
- Resources Available to NIH Summer Students

## Science Skills Boot Camp

## Workshop 1: The Culture of Research Environments

Keren Witkin, PhD

www.training.nih.gov

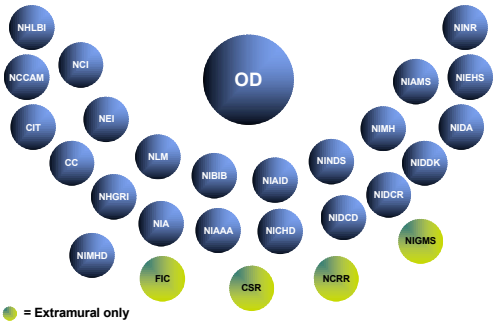
## Outline

- NIH overview
- Types of research environments
- Settling into your research group
- Rules and regulations
- Research culture
- Getting the most out of your summer

## What is the NIH?

- One agency of the U.S. Department of Health and Human Services
- Extramural granting agency
- Intramural Research Program
- Composed of 27 Institutes and Centers (ICs)

## 27 NIH Institutes and Centers

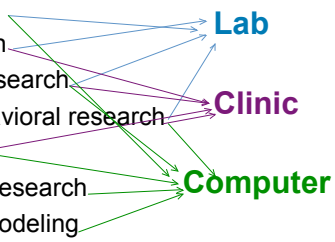


## NIH Campuses

- Bethesda, MD
- Rockville, MD
- Baltimore, MD (NIA, NIDA)
- Frederick, MD (NCI)
- Poolesville, MD
- Research Triangle Park, NC (NIEHS)
- Hamilton, MT (NIAID)
- Detroit, MI (NICHD)
- Phoenix, AZ (NIDDK)
- Framingham, MA (NHLBI)

## What kind of research happens at the NIH?

- Basic research
- Clinical research
- Translational research
- Social and behavioral research
- Epidemiology
- Computational research
- Mathematical modeling




## What is **basic research**?

- Trying to understand how things work
- Increasing knowledge without specific social or commercial benefit
- "Knowledge for knowledge sake"
- Lays the foundation for future discoveries

## Examples of basic research:

- Studying PDE5 phosphodiesterase enzyme and its interaction with cyclicAMP
- Constructing transgenic mice that produce less hemoglobin
- Screening for inhibitors of a protein tyrosine kinase

## What is **clinical research**?

- Research involving human subjects or material from human subjects that can be traced back to living individuals
  - Working with patients
  - Working with blood or tissue samples
  - Working with observations of behavior
  - Working with questionnaires
- Includes, but not limited to, clinical trials

## Examples of clinical research:

- Studying cells from colon cancer patients to determine if they have a particular DNA polymorphism
- Evaluating the safety and effectiveness of a new drug that treats breast cancer
- Doing MRI brain scans of right- and left-handed people

## What is **translational research**?

- Aims to integrate basic research with clinical applications
- **"Bench to Bedside"**

Example:
Finding better production methods for the influenza vaccine
- •Basic research
- •Clinical research
- •Patient care

Manipulating influenza genome on plasmid

↓

Transfecting tissue culture cells

↓

Creating tissue culture source of influenza vaccine

↓

Testing for safety and effectiveness

↓

Patient use

## What is **social and behavioral research**?

- Strives to identify general principles of behavioral and social functioning, as well as their influence on human health
- Uses a variety of approaches including surveys, interviews, observation, evaluation, lab experiments and clinical trials

## Examples of social and behavioral research:

- What is the effect of illness on social functioning?
- How do people make decisions about genetic testing?
- What is the impact of providing smokers with anti-smoking literature?

## What is **epidemiology**?

- Studying the patterns of health and illness at the population level

Examples-
- Do people who eat red meat have higher incidence of diabetes?
- Do women exposed to certain pesticides have higher rates of breast cancer?

## What is **computational research**?

- Joins biology and computer science, engineering, math and physics
- Uses computers to address problems in biology and medicine
  - Bioinformatics
  - Genome assembly
  - High-throughput analysis of large data sets
  - Mathematical modeling

## What is **mathematical modeling**?

- Describing a natural system using mathematical language

$$F_0 = \frac{L}{m} - w\frac{J}{J+1}, \quad H_0 = \frac{1}{J}F_0 \quad \text{where}$$

$$J = \frac{1}{2}\left[\left(\frac{\alpha}{m} - \frac{\sigma}{m} - 1\right) + \sqrt{\left(\frac{\alpha}{m} - \frac{\sigma}{m} - 1\right)^2 + 4\frac{\alpha}{m}}\right]$$

$$m < \frac{L}{2w}\left(\frac{\alpha + \sigma + \sqrt{(\alpha-\sigma)^2 + 4\frac{L\sigma}{w}}}{\alpha - \frac{L}{w}}\right) \quad \text{and} \quad \alpha - \frac{L}{w} > 0.$$

Khoury et al. 2011. *Plos One*

## Diverse research within a single lab or research group

**Cancer biology**

**Basic research** | **Mathematical modeling** | **Epidemiology**

## Who are the people in your research group?

- Principle investigators (PI)
- Staff scientists
- Postdoctoral fellows
- Clinical fellows
- Graduate students
- Medical students
- Technicians
- Postbac IRTAs
- Technical IRTAs
- Summer students

## Summer Interns:

**Bottom of the totem pole?**

OR

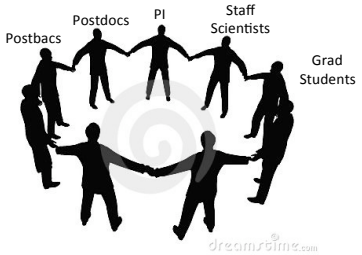
**Playing an important role in the lab?**

## A tale of 2 PIs

- Hands-on
- Found in the lab/office or close-by
- Talks with students and fellows all the time
- Called by his/her first name

- Hands-off
- Locked in his/her office or away at meetings
- Meets with trainees for formal meetings scheduled in advance
- Called Dr._____

## Getting to know the whole group



## Question:

- Imagine that you are asking your mentor for a recommendation letter for graduate or medical school, what would you like the letter to say?

## A good mentor is a(n):

- Advisor
- Critic
- Coach
- Advocate
- Teacher
- Role model

## What expectations should you have of your lab mentor?

- Intellectual support and guidance
- Interest in **your** ideas & opinions
- Guidance in scientific ethics, lab safety, and appropriate respect for animals and human subjects
- Honest feedback regarding your performance
- Respect and professionalism in all interactions
- Help in growing your professional network
- Consideration of your request for recommendation letters

## What if my mentor doesn't meet these expectations?

- Deal with it?
- Complain to PI?
- **Talk to mentor about your needs/expectations?**
- **Seek additional mentors?**

## Interacting with your mentor

- Be respectful and courteous
- Adapt to his/her mentoring style
- Accept criticism with grace
- Ask when you have questions
- Find balance between being independent and asking for help
- Address problems before they escalate

## Interacting with your group members

- Be polite, professional and courteous
- Be respectful of diversity
- Recognize that everybody is busy and that this may not be a good time to talk
- Follow their lead

## Different research groups have their own culture

- How loud is the room?
- How clean/organized is their research space?
- What hours do people work?
- How do people dress?
- Do group members use Ipods or cell phones?
- Do group members eat lunch together?
- Do group members go to seminars together?

## Mandatory activities

- Group meeting?
- Journal clubs?
- Seminars?

## Be a good lab citizen

- Keep common space clean
- Don't disturb other people's work
- Be extremely careful with common reagents and equipment
  - Don't contaminate!
  - Replace common reagents if they are running low
  - **Ask for help** if you don't know how to use equipment
  - Tell somebody if equipment is broken

## Case studies

## NIH rules and regulations

**Everybody must:**

- Be officially appointed as IRTA, FTE, or special volunteer
- Be at least 16 years old
- Get an NIH badge
- Complete the appropriate safety training

## Other rules and regulations:

- No food or drink in labs
- No smoking or alcohol on NIH campus
- Limits on personal computer use
- No keys for summer students

## If you are under 18:

**Your parent/guardian must complete two forms:**

- Authorization for Treatment of a Minor
- Safety Consent for Minors

**You may not work with the following:**

- Radioactivity
- Blood, body fluids, or non-human tissue
- Non-human primates
- Primate retroviruses
- Select carcinogens, toxins, or infectious agents

**You may not work in a Biosafety Level 3 or 4 Lab**

## "Research is formalized curiosity. It is poking and prying with a purpose."

Zora Neale Hurston

## Scientific research . . .

- Is a team effort


www.barcelonafootballblog.com

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nataliedee.com

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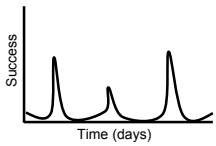

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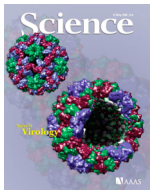
## Scientific research . . .

- Is a team effort
- Involves asking small, manageable questions
- Often moves slowly
- Contains periods of frustration between successes
- Is not a 9-5 job
- Must always be documented

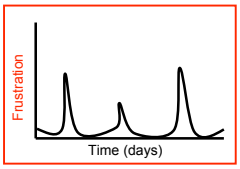
## For data to be publishable, your work must be:

- Meticulous
- Reproducible
- Well-documented




## Science can be unpredictable

- Don't get frustrated!
- Ask for help
- Be creative
- Be flexible with your research plan




## A typical day of research

- At the bench
  - Doing experiments
  - Making reagents
- Away from the bench:
  - Planning experiment
  - Analyzing data
  - Thinking about your project
  - Reading papers

## What if you don't have any work to do?

- Read papers
- Think about your project
- Plan experiments
- Learn about other people's projects
- Volunteer to help others
- Start your poster

To get the most out of your summer:

**Make a plan**


Share it with your mentor!

## To achieve your research goals

- Meet with your mentor(s) early and often!
- Be clear about expectations- yours and your supervisor's
- Read papers related to your work
- Attend the Summer Lecture Series
- Make sure you understand both the big picture and the details of your research
- Pay attention and participate during group meeting
- Volunteer to give a talk in your group meeting
- Present a poster at Summer Poster Day
- Attend a Summer Journal Club

## This is your summer job . . . But it's also a training experience!

- Attend seminars and workshops
- Take advantage of NIH resources
- Talk to other researchers
- Network
- Have fun

## **Summary:** What your research group expects of you:

- Attention to safety
- Respect for diversity
- Respect for animal models
- Professionalism, especially when dealing with patients
- Participation in all lab/group activities
- Engagement in your research project
- Honest communication about your research

## Looking out for yourself

**Reasonable expectations:**

- To be treated fairly and with respect
- To have some guidance from a mentor
- To have appropriate training when working with dangerous equipment or hazardous chemicals
- To have (at least a little) time to work on professional development

## If problems arise

- Be mature and rational
- Try to address the problem early, by talking calmly with the person you are conflicting with
- If necessary, talk to your PI or other mentors
- If necessary, seek help from your IC training director, OITE, or the NIH Office of the Ombudsman

## What if something really bad happens?

**You are not alone!**

- Your principle investigator
- Your IC training director
- Dr. Sharon Milgram, OITE Director
  milgrams@mail.nih.gov
- Dr. Pat Sokolove, OITE Deputy Director
  sokolovp@mail.nih.gov